Inter-Island Bandwidth Projection Study

Prepared for

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EXECUTIVE SUMMARY

PURPOSE

Anticipated bandwidth for the next twenty years will increase at an exponential rate due to increased demand for personalized services that will drive usage for voice, video, data and wireless applications. Discovery Institute projects that bandwidth requirements will increase 50 fold during just the 10-year period from 2005 – 2015. Given other corroborating industry projections and the unique inter-island configuration and cumulative bandwidth flow of traffic back to Oahu, our study concludes that the Hawaii undersea fiber should be sized to accommodate an anticipated bandwidth of 1.2 Terabits per second by the year 2028.

The Bandwidth Demand Projection Study has been prepared at the request of Waimana Enterprises to provide a determination of the inter island bandwidth requirements for the next 20 years. The data is based on current demands for bandwidth for not only Waimana's subsidiary, SIC, but inter-island transport for existing voice, data, video, wireless and private network requirements. The Bandwidth Demand Projection Study is designed to assist SIC with the determination of fiber sizing for under sea cable to be installed in the near future.

The bandwidth projection data was assembled using current demand criteria and the bandwidth projected for the next twenty years based on data from conference calls with SIC, Technology Futures, Inc. and Alcatel Lucent studies to project anticipated broadband consumption between the islands and the cumulative effect of the current island transport structure back to Oahu. Based on the existing consumption and the projected demand designs considered the inter-island traffic was calculated using agreed upon and industry standard oversubscription rates to determine each island's traffic based on voice, data, video, wireless and private network.

CHR Solutions believes that a minimum of 144 fibers between the islands will provide the needed additional bandwidth for future services based on the use of single fiber technology. CHR believes

that transport networks should be designed for IP packet based transport and the inclusion of MPLS or PBB to achieve the carrier class Quality of Service (QOS) that will be required in the future. Consideration should be given to alternate island access points to provide route diversity.

INDUSTRY BACKGROUND

The communications industry is currently undergoing more change in the past 5 years than has taken place in the last 50 years. Traditional telephone companies that were circuit based, TDM, voice centric companies, are now moving toward a packet based IP broadband companies. Traditional TDM voice lines are being replaced by broadband VoIP and wireless alternatives. The requirement for mobile voice and data are creating a new type of user that wants content with them at all times and places. In the home the trend is to a customer experience model, that gives the customers of tomorrow the opportunity to access information, communication and entertainment at any place, at any time and on the device of choice. This wide range of requirements for broadband and entertainment services are challenging service providers to provide an affordable pipe to customers to compete with all providers. SIC is in a unique position to be able to provide inter-island transport for not only itself, but to the voice, data, video, wireless and private network providers that are in some cases competitors to SIC services.

According to Technology Futures, residential data rates will continue to increase over the next twenty years and will approach one (1) gigabyte per second that will be required to connect the home of tomorrow. This forecast for bandwidth consumed is also shared by Cisco, in August 2007 with the "Exabyte Era". Broadband data is projected to continue to increase not only on the downstream side as customers will demand more content into the homes, but upstream bandwidth is anticipated to increase as more pictures, video, and social network content are uploaded to other sites and users.

Entertainment video continues to require more bandwidth as High Definition (HD) becomes more widely accepted and the cost of the televisions decrease. Very high quality video will continue to be

thought of as a necessary service along with the use of Personal Video Recorders (PVR), multiple stream set top boxes and Video on Demand (VOD) drive the entertainment usage in the home. Video is also one of the services that will continue to gain momentum on the upstream as more customers will want to export video surveillance, home video conferences and home monitoring as these services become more main stream.

Business bandwidth will continue to increase as the office becomes more data centric, but without the requirement of video, this area of transport does not require the dramatic increase of inter-island as compared to the video and wireless services.

Wireless, voice and data requirements along with video requirements make up the large majority of the increase of usage. As more and more of the population become mobile voice users the addition of mobile becomes a very large part of the requirements of the future. Wireless data continues to increase in use and applications as consumers require access to Internet content, video clips, pictures, global positioning satellite (GPS) and music from their mobile device. Consumers want to have instant access to multiple services and at the same time be mobile. The promise of IMS services and revenues is not clearly defined at the moment, but companies such as Alcatel-Lucent, AT&T and Verizon are investing considerable resources and money to bring seamless mobility to reality.

Private Networks are devoted to bandwidth requested by universities, the military and other private institutions for their internal communications requirements. While these requirements may increase many times, the quantity of services do not have a dramatic effect on the total requirements.

SANDWICH ISLES POSITION

Sandwich Isles currently is in a very desirable position since all the inter-island transport can be funneled through the SIC facilities. Hawaiian Telcom, Verizon, AT&T, Sprint, Time Warner, institutional, military and private providers may eventually be dependent on SIC for inter-island transport. The current SIC distribution facilities and the ever increasing demand for bandwidth by SIC and its wireline competitors and the current wireless providers, make it clear that SIC as the first to provide so large a pipe, providing outstanding Quality of Service (QOS) at an affordable price, will discourage the other distribution competitors from wanting to enter the inter-island transport market. While specific revenue sources for distribution bandwidth in the next twenty years is unclear, the position of SIC in the inter-island transport market will be an integral part of the state's economy and the ability to provide next generation services. Insufficient inter-island transport facilities today will create this opportunity for SIC.

SIC's island layout provided for a cumulative factor of each island on the other as traffic was homed backed to Oahu. Traffic from Hawaii to Maui was calculated using the study data and assumptions. The inter-island traffic from Hawaii to Maui was added to the Maui to Moloki traffic as noted in the table below. That traffic was added to the Moloki to Oahu traffic to calculate the total bandwidth required to Oahu. Calculations were also determined from Kauai to Oahu for that inter-island bandwidth.

STUDY RESULTS

CHR calculated, using a disciplined approach, a calculation model based on current and projected census data, the current households, businesses population and private network data. Using projected data from several futurist organizations such as TFI, Inc., bandwidth usage was calculated for each island based on residential, business, wireless and private network requirements for the next twenty years.

Residential bandwidth was calculated using the current census data for each islands households. It was estimated that in the future 90% of the households would be wired for one or more of the available voice, video or data wired services. Since the demand for bandwidth in the home is projected to increase dramatically for information, communication and entertainment as the population desires higher data speeds, voice that will include telepresence and virtual identities and the ever increasing desire for not only HD entertainment, Ultra HD, 3D HD and holograms that will allow the home of the future to have their world come to them. This will truly be content anytime, anywhere and on any device that they choose. Calculations using a services based model determined that a residence would require slightly greater that 100 Mbps downstream and greater that 25 Mbps upstream. There were allowances made for more advanced encoding capabilities in the future as more bandwidth intensive services are developed. An oversubscription rate of 20 times was used to account for not everyone using the content all of the time. This oversubscription factor had become a standard value within data service applications and was not modified. The island population was grown by 1% per year and the quantity of household held a constant of 2.28 persons per household. Residential video bandwidth continues to increase over the study time as more HD streams are introduced into the home, personal video recorders (PVR) bring multiple video streams into the home and the demand for HD and greater resolution display become more common and approach holography. Eighty percent of the residential traffic would be inter-island due to the transport of

video, Video on Demand content, inter-island voice and data.

Business bandwidth was calculated using the current census based data. The quantity of businesses was based on the current 42.44 persons per business and grew based on the population growth. The assumption was made that 100% of the businesses would require wireline access to voice and data. Video to businesses was calculated for video services to hotels and convention centers. Business bandwidth increased from the current demand of 8Mbps downstream / 3.7Mbps upstream to almost 80 Mbps downstream / 33 Mbps upstream. Inter-island traffic was assumed to be 30% of the total distribution traffic due to the local nature of small businesses on the islands that feed bandwidth to Oahu. Due to the small quantity of business outside of Oahu and their trend to be very small to small establishments the inter-island traffic did not contribute very heavily to the total transport requirements.

Wireless bandwidth contributed to the greatest increase in demand both for the individual islands and the inter-island transport. Calculations were based on 80% of the population having a mobile phone. The mobile user of the next few years will receive not only voice over their mobile device, but that device will also be personalized access for data and video traffic as content is provided to customers wherever they may be. As the mobile device population lowers to junior high and elementary students, the degree of usage for the seniors will increase as the application interfaces become more user friendly. The quantity of mobile phones grew with the population growth of each island. The bandwidth consumed by each user will increase from, a current mainly voice-based requirements for 1.2Mbps downstream / 0.27Mbps upstream, to greater than 100 Mbps downstream / 26 Mbps upstream. These bandwidths are not currently available, but Alcatel – Lucent projections (See appendix) claim that these bandwidths are achievable given the efficient use of spectral efficiencies. The bandwidth calculated would depend on the release of sufficient spectrum by the FCC. Adjustments were allowed for tourist influx into the island and that 80% of this traffic would be inter-island on the way to the mainland. Based on projected data tourist growth was predicted to be

flat.

Private Network included dedicated service between military, colleges, observatories bandwidth back to Oahu. Entities identified are as follows: For Kauai; Pacific Missile Range, State / Kauai County, Civil Defense / Homeland Security, Carrier Emergency Backup. For Molakai; Molakai CC, Civil Defense / Homeland Security, Carrier Emergency Backup. For Maui; Maui CC, Civil Defense / Homeland Security, Carrier Emergency Backup. Hawaii; KECK Observatory, UH Hilo, Pahuloa Army Training Center, Civil Defense / Homeland Security, Carrier Emergency Backup. Each of these private networks will not require individually a large quantity of bandwidth, but cumulatively will provide a reliable transport revenue stream for SIC. Private Networks usually require a defined quantity of bandwidth, with a more connected world, this will require both on a pure demand model, or as a backup for their private satellite network, a large dependable broadband pipe.

GBPS

From	To	Service	2009	2018	2028
Hawaii	Maui	Residential	71.8	188.4	336.2
		Business	0.3	1.9	3.9
		Wireless	2.2	44.9	244.7
		Military / Institutional	4.2	21.0	70.0
		Total	78.7	256.2	654.8

Cumulative GBPS

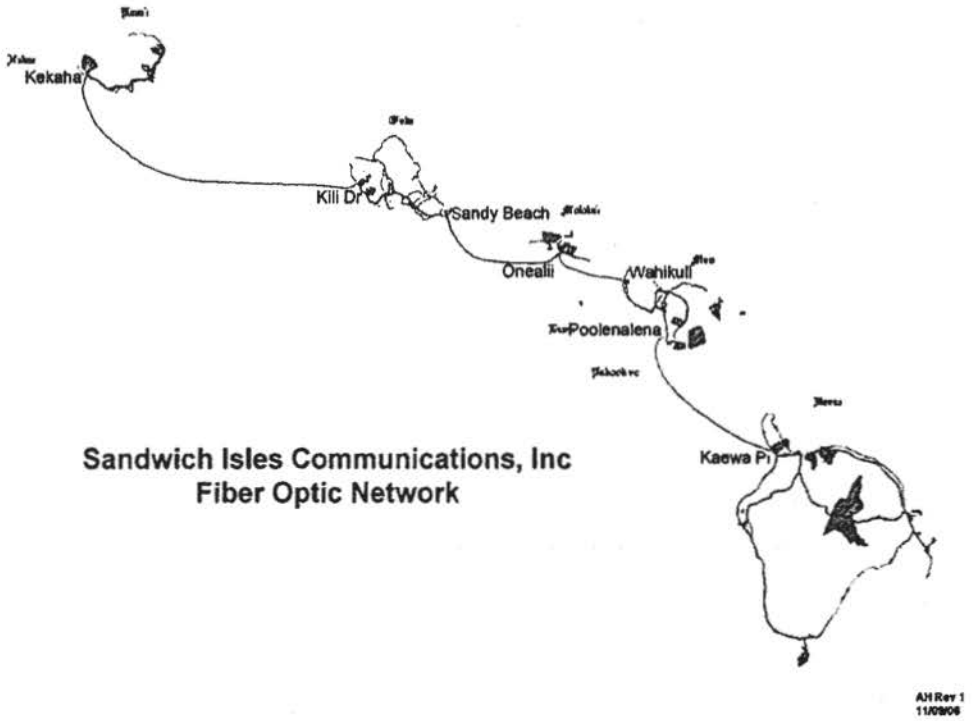
From	To	Service	2009	2018	2028		2009	2018	2028
Maui	Moloki	Residential	59.4	155.6	277.8		131.2	344.0	614.0
		Business	0.4	2.4	4.8		0.7	4.2	8.7
		Wireless	2.1	40.8	220.7		4.3	85.8	465.3
		Military / Institutional	2.7	12.0	40.0		6.9	33.0	110.0
		Total	65.5	210.8	543.3		143.1	467.0	1,198.1

From	To	Service	2009	2018	2028		2009	2018	2028
Moloki	Oahu	Residential	2.7	7.2	12.8		133.9	351.2	626.8
		Business	0.0	0.9	3.2		0.8	5.1	11.9
		Wireless	0.0	0.0	0.0		4.3	85.8	465.3
		Military / Institutional	0.2	1.8	12.0		7.2	34.8	122.0
		Total	3.0	9.8	28.0		146.1	476.8	1,226.0

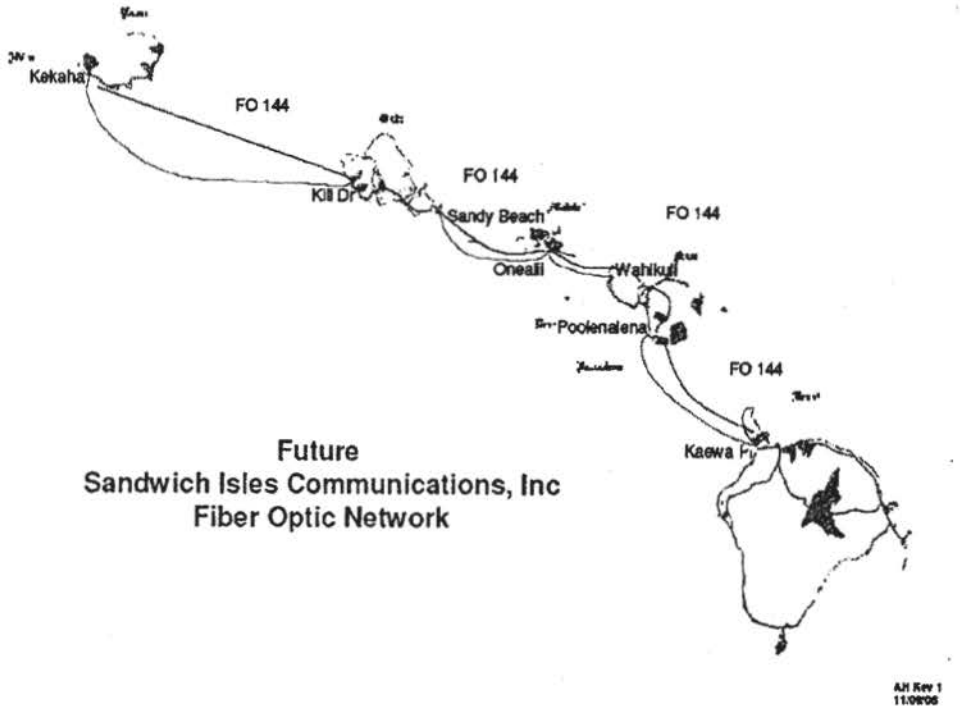
Westward to Oahu

From	To	Service	2009	2018	2028
Kauai	Oahu	Residential	26.4	69.3	123.7
		Business	0.2	1.0	2.2
		Wireless	0.9	18.5	99.7
		Military / Institutional	4.4	7.0	42.0
		Total	32.0	95.9	267.6

EXISTING NETWORK



FUTURE NETWORK



CONCLUSIONS

Facilities placed now should have the capabilities of supporting inter-island next generation voice, video and data over a variety of methods. The consumer of tomorrow will want their information, communication and entertainment delivered time shifted to them wherever they may be and on the device that they choose whether it be the automobile, PC, HDTV or mobile device. Based upon the data and forecast tools available, CHR believes that a minimum of 144 fibers of undersea cable would allow sufficient bandwidth in the upcoming 20 years of the study. Alternate access points to inter-island facilities should be considered to further enhance route diversity for essential transport facilities. To provide enhanced QOS consideration should also be given to inclusion of an MPLS or PBB to ensure carrier grade transport.

Strategic Network Planning

Sandwich Isles Communications

September 2009

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1 Executive Summary

Sandwich Isles Communications (SIC) has enlisted the services of Vantage Point Solutions (VPS) to evaluate their existing transport and switching networks and provide recommendations on continued network enhancements.

VPS provided a data request to SIC, as well as met with met with their staff the week of July 20-24, 2009 to collect information concerning the existing network topology. This information was used to help formulate the recommendations for the SIC network that are included in this document.

One of the first requirements when evaluating the SIC network was to project the bandwidth requirements for voice, high-speed data, and video services to the end customers of SIC. SIC is unusually situated when compared to most telecommunications companies in the fact that they are growing the number of voice subscribers and data subscribers in their exchange. Due to this unusual growth, VPS relied on data provided by SIC which details the subscriber counts, projected penetration rates, and data bandwidth packages through the year 2013. This data was used to project the bandwidth requirements for voice and data services. In addition, VPS made several assumptions regarding the channel lineup and video encoding parameters for a future IP Video service to be offered by SIC. The results of the bandwidth projections for the voice, data, and IP video services in 2013 are as follows:

- Voice Services – 60 DS-1's (Approximately 3 STS-1's)
- High-speed Internet – 1,184 Mbps (Approximately 27 to 30 STS-1's)
- IP Video – 1,575 Mbps (Approximately 24 STS-1's)

Details regarding these bandwidth projections can be found in the following sections of this report.

Based on these projections, it was determined that the OC-48 SONET network that was deployed to carry voice and data services is appropriately sized to meet the customer demands. In addition, the OC-192 SONET network for video services is adequately size to carry the future IP Video traffic.

The service that is difficult to determine the bandwidth requirements for is the capacity lease services. This is due to the fact that there is no historical information on which to base any projections. However, VPS feels that the unique geographical considerations for the service territories of SIC make them well positioned to provide capacity lease services to other entities for TDM traffic, Ethernet traffic, or lambda services. Based on this, VPS developed the following recommendations for the Transport network.

- Connect East and West Transport networks via fiber optic cable
- Implement DWDM system for Layer 2 Ethernet transport services

With regards to the SIC Switching network, the current network configuration includes Lucent Class 5 switching equipment, MetaSwitch Class 5 softswitches, and various Digital Loop Carrier (DLC) electronics. This switching network has evolved over the years out of necessity.

SIC is concerned about the fact that they rely heavily on Hawaiian Telecom for Access Tandem and SS7 services. Hawaiian Telecom is currently in Chapter 11 bankruptcy protection, and the future of the company is uncertain.

After taking into account the various network service goals and concerns, VPS formulated recommendations for the SIC Switching network. The recommendations are summarized as follows:

- Continue the Deployment of MetaSwitch Media Gateways (retire Lucent switches)
- Implement a Feature Server and the Associated Service Offerings
- Conduct A-link Consolidation and Evaluate SS7 Service Options
- Explore Options for Access Tandem Services

While the Network Operations Center (NOC) that has been implemented by SIC is in a temporary building, the primary functionalities available to SIC appear to meet the current network needs. However, as the network grows due to a potential acquisition of Hawaiian Telecom or due to capacity lease sales, it may be necessary to staff the NOC 24 hours per day and to add Service Level Agreement (SLA) reporting capabilities for the end customers. In addition, SIC should consider developing several key procedure documents such as trouble reporting/escalation procedures, network maintenance notification procedures, network outage reporting procedures, and disaster recovery planning documentation.

Additional details concerning the specific recommendations are provided in subsequent sections of this report.

2 System Overview

Sandwich Isles Communications (SIC) is a subsidiary of Waimana Enterprises, Inc. that provides communications services to approximately 30 of the 69 Hawaiian Home Lands areas. SIC currently provides telecommunications services to approximately 2,000 access lines in these areas.

Over the past several years, SIC has been actively upgrading their Access, Switching, and Transport networks. They have been constructing Fiber to the Premises (FTTP) to deliver voice and high-speed Internet services to their subscribers. With regards to their switching network, SIC has implemented MetaSwitch media gateway chassis to provide softswitching functionality in the offices of Kekaha and Nanakuli. In addition, SIC recently completed a long-term project to connect the islands of Kauai, Oahu, Molokai, Maui, and Hawaii with fiber optic cable and transport electronics.

The goal of this section of the strategic plan is to establish a strategic plan to outline the proposed network enhancements for SIC's transport and switching network. These network enhancements are anticipated to take place over the next 5 to 7 years.

3 Transport Network

3.1 Existing Transport Network

The SIC Transport Network is currently separated into two distinct pieces, a West system and an East system. The West Transport Network connects Kauai to Oahu, and transport electronics have been deployed at Kekaha (Kauai) and Nanakuli (Oahu). The transport electronics consist of a combination of Fujitsu Flashwave 7120 equipment (optical amplifiers) and Fujitsu Flashwave 4500 electronics (SONET multiplexer). There are a total of three (3) OC-48 systems in place that provide transport for voice and data services, IP video services, and capacity lease services respectively. Please refer to the logical diagram shown in Figure 2-1.

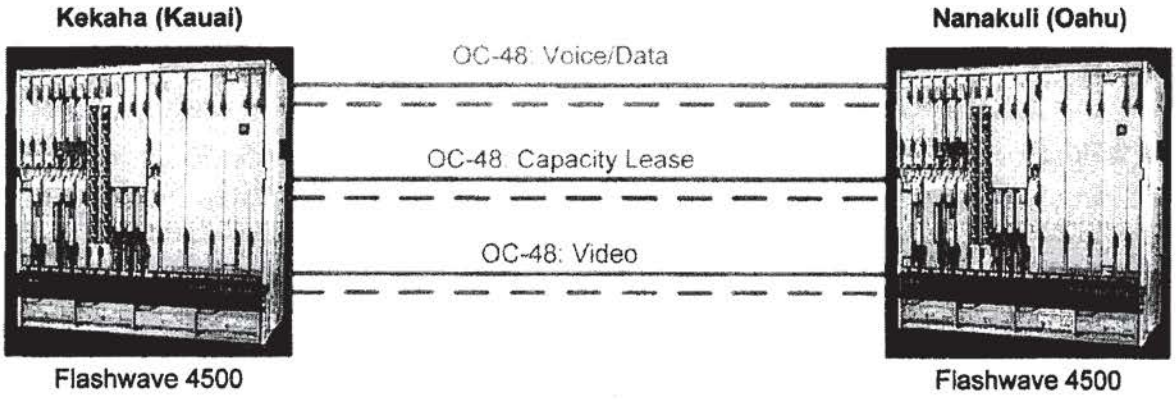

Figure 3-1 – West Transport Network Logical Diagram

Similar to the West system, the East Transport Network connects the islands of Oahu, Molokai, Maui, and Hawaii. Once again, Fujitsu Flashwave 7120 and Flashwave 4500 terminals were utilized in this network. The design includes an OC-48 system for voice and data services that connects from Waimanalo (Oahu) to Kalamaula (Molokai) to Pu'unene (Maui) to Pu'ukapu (Hawaii). In addition, there is an OC-192 system from Waimanalo to Kalamaula, Waimanalo to Pu'unene, and Waimanalo to Pu'ukapu for IP Video services. Finally, OC-48 systems were implemented from Waimanalo to Kalamaula, Waimanalo to Pu'unene, and Waimanalo to Pu'ukapu for capacity lease services. Please refer to the logical diagram for the East Transport Network found in Figure 2-2.

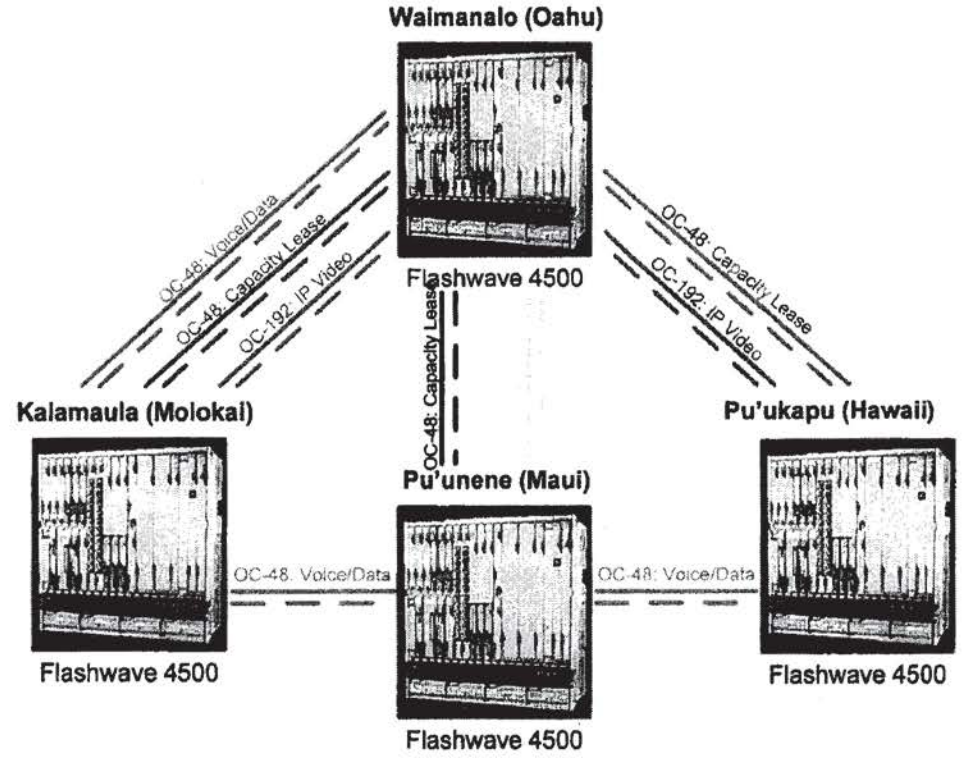

Figure 3-2 – East Transport Network Logical Diagram

Based on the current configuration, both the West Transport Network and the East Transport Network have the ability to drop off DS-1, DS-3, and Gigabit Ethernet interfaces at the respective locations. Additional circuit interfaces can be equipped at these sites with the purchase of circuit cards.

3.2 Bandwidth Requirements for SIC Customers

When evaluating the transport network, it is necessary to project the bandwidth requirements for SIC to serve their end subscribers. First, the services that SIC intends to deliver to the end customer must be identified. At this time, SIC is offering TDM voice services, as well as high-speed Internet to their customers. It is their intention to offer IP Video services to their subscribers in the future, as well.

SIC is unique in comparison to other rural communications companies in the fact that their service territories are growing in both population and access lines. This population growth on the Hawaiian Homelands is a positive trend, but it does create issues with regards to the forecasting of future services, and thus future bandwidth requirements. For the purposes of this analysis, Vantage Point Solutions relied on SIC to provide forecasts for growth in access lines and high-speed Internet customers. Table 2-1 and Table 2-2 provide details regarding the expected growth trends for these services.

Kauai	2009	2010	2011	2012	2013
Residential Lines	108	184	300	325	345
# Residential Subs	98	167	273	295	314
Business Lines	40	50	130	195	270
# Business Subs	8	10	26	39	54

Oahu	2009	2010	2011	2012	2013
Residential Lines	950	1499	1684	1809	1934
# Residential Subs	864	1363	1531	1645	1758
Business Lines	400	505	590	670	740
# Business Subs	80	101	118	134	148

Hawaii	2009	2010	2011	2012	2013
Residential Lines	310	400	565	730	855
# Residential Subs	282	364	514	664	777
Business Lines	177	197	377	522	687
# Business Subs	35	39	75	104	137

Molokai	2009	2010	2011	2012	2013
Residential Lines	138	142	142	152	152
# Residential Subs	125	129	129	138	138
Business Lines	67	92	102	117	117
# Business Subs	13	18	20	23	23

Lanai	2009	2010	2011	2012	2013
Residential Lines	17	22	28	32	32
# Residential Subs	15	20	25	29	29
Business Lines	5	5	20	25	35
# Business Subs	1	1	4	5	7

Maui	2009	2010	2011	2012	2013
Residential Lines	816	1036	1086	1136	1211
# Residential Subs	742	942	987	1033	1101
Business Lines	50	65	145	225	325
# Business Subs	10	13	29	45	65

TOTAL SIC	2009	2010	2011	2012	2013
Residential Lines	2338	3284	3805	4184	4529
Business Lines	739	914	1364	1754	2174
Total Access Lines	**3077**	**4198**	**5169**	**5938**	**6703**

Table 3-1 – Sandwich Isles Communications Access Line Projections

Kauai	2009	2010	2011	2012	2013
Residential Broadband Subscribers	29	67	136	207	267
Business Broadband Subscribers	6	8	21	33	49

Oahu	2009	2010	2011	2012	2013
Residential Broadband Subscribers	259	545	765	1151	1494
Business Broadband Subscribers	56	76	94	114	133

Hawaii	2009	2010	2011	2012	2013
Residential Broadband Subscribers	85	146	257	465	660
Business Broadband Subscribers	25	30	60	89	124

Molokai	2009	2010	2011	2012	2013
Residential Broadband Subscribers	38	52	65	97	117
Business Broadband Subscribers	9	14	16	20	21

Lanai	2009	2010	2011	2012	2013
Residential Broadband Subscribers	5	8	13	20	25
Business Broadband Subscribers	1	1	3	4	6

Maui	2009	2010	2011	2012	2013
Residential Broadband Subscribers	223	377	494	723	936
Business Broadband Subscribers	7	10	23	38	59

TOTAL SIC	2009	2010	2011	2012	2013
Residential Broadband Subscribers	638	1194	1729	2663	3499
Business Broadband Subscribers	103	137	218	298	391

Table 3-2 – Sandwich Isles Communications Broadband Subscriber Projections

The information found in Table 2-2 was calculated by multiplying the number of residential and business subscribers listed in Table 2-1 times an assumed penetration rate for the broadband services. The assumptions for penetration rates, as well as the projections for the specific data package take rates for broadband residential and business subscribers, can be seen in Table 2-3.

DSL PENETRATION RATES

Residential Penetration	30%	40%	50%	70%	85%
Business Penetration	70%	75%	80%	85%	90%

Residential Subscribers	**2009**	**2010**	**2011**	**2012**	**2013**
3 Mbps/768 Kbps	60%	0%	0%	0%	0%
6 Mbps/1 Mbps	30%	55%	50%	20%	5%
15 Mbps/3 Mbps	10%	42%	40%	30%	10%
50 Mbps/5 Mbps	0%	3%	10%	50%	45%
100 Mbps/10Mbps	0%	0%	0%	0%	40%
	100%	100%	100%	100%	100%

Business Subscribers	**2009**	**2010**	**2011**	**2012**	**2013**
3 Mbps/768 Kbps	10%	0%	0%	0%	0%
6 Mbps/1 Mbps	70%	40%	20%	10%	0%
15 Mbps/3 Mbps	20%	40%	50%	40%	20%
50 Mbps/5 Mbps	0%	20%	30%	40%	50%
100 Mbps/10Mbps	0%	0%	0%	10%	30%
	100%	100%	100%	100%	100%

Table 3-3 – Broadband Service Penetration Rate Projections

Based on the subscriber count projections show in Table 2-1 and Table 2-2, Vantage Point Solutions developed estimates of the capacity requirements for the next five years. These projections in the total transport bandwidth requirements factored in the voice, data, and video services that SIC expects to provide to their end customers. Please refer to Table 2-4, Table 2-5, and Table 2-6.

Forecasted Voice Services - Measured in DS-1's

Island	2009	2010	2011	2012	2013
Hawaii	5	5	8	11	13
Kauai	2	2	4	5	6
Lanai	2	2	2	2	2
Maui	8	10	11	12	13
Molokai	2	2	3	3	3
Oahu	12	17	19	21	23
Total	**31**	**38**	**47**	**54**	**60**

Assumptions:

Estimate based on 1 trunk per 5 DS-0's

DS-1 count was rounded up to nearest whole number

Minimum of 2 DS-1's required for each island

No capacity lease services are included in the bandwidth projections

Result: By 2013, a total of 60 DS-1's is projected to be required for the voice services on the SIC transport network. This equates to approximately 3 STS-1's that utilize VT1.5-mapping.

Table 3-4 – Forecast of Transport Requirements for Voice Services

Forecasted Internet Data Services - Measured in Mbps

Island	2009	2010	2011	2012	2013
Hawaii	4	13	32	98	260
Kauai	1	5	14	41	104
Lanai	0	1	2	4	11
Maui	5	19	35	106	283
Molokai	2	5	8	21	45
Oahu	11	42	71	193	481
Total	**23**	**85**	**161**	**463**	**1184**

Assumptions:
Business DSL Subscribers will have an oversubscription ratio of 80:1
Residential DSL Subscribers will have an oversubscription ratio of 250:1
Based on SIC projections for subscriber penetration and data packages
No capacity lease services are included in the bandwidth projections

Result: By 2013, a total of 27 STS-1's is projected to be required for the data traffic on the SIC transport network (assuming Resilient Packet Ring Ethernet transport). If point-to-point Ethernet over SONET transport is utilized, a total of 30 STS-1's may be required by 2013.

Table 3-5 – Forecast of Transport Requirements for High-Speed Internet Services

As stated previously, the SIC Transport network included an OC-48 to carry voice and high-speed Internet services from Oahu to the various other islands. Based on the projections shown in Table 2-4 and Table 2-5, the anticipated demand for TDM services (excluding capacity lease services) is approximately 3 STS-1's of capacity and the anticipated transport requirements for high-speed Internet services is approximately 27 to 30 STS-1's by the end of 2013. Therefore, a total of approximately 30 to 33 STS-1's is expected to be required for voice and data services. An OC-48 system has a total capacity of 48 STS-1's; therefore, the current OC-48 is expected to be adequate to transport the voice and high-speed Internet services over the next 5 years.